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09/843,924	04/30/2001	Kazunori Sakurai	109182	9915

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EXAMINER

LUHRS, MICHAEL K

ART UNIT

PAPER NUMBER

2824

DATE MAILED: 10/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/843,924

Applicant(s)

SAKURAI ET AL.

Examiner

Michael K. Luhrs

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 28-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5,7,9-13,18,19,21,25-27,31 and 32 is/are rejected.
- 7) ☒ Claim(s) 6,8,14-17,20 and 22-24 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: *updated search*.

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DETAILED ACTION

This supplemental office action addresses claims 9, 10 and 22 that were not addressed in Office action, Paper #14, sent 7/11/03. The examiner regrets the omission.

Specification

1. The disclosure is objected to because of the following informalities: Previous office action objection not addressed, is repeated:

The specification: p. 17, line 23, "anisotropically conductive material 74". The region shown by '74' (Fig. 9) would not be conductive.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 7 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Regarding claim 7, claim 1 uses the resist to define a through hole and then claim 7 forms the first metal layer in the through hole but has the resist layer *removed*. There is no way to define a through hole with a resist (claim 1) that will accept the first metal layer while saying that *said resist will not be present* (claim 7).

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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5. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claim 4, a through hole being formed at “an inner side of the periphery of the pad”, --“inner side of the periphery” is being interpreted as interior portion of the pad. The wording could be improved such as “interior periphery of the pad”. The limitation “at an outer side of the center of the pad” is however unclear, a “center” itself, having no “sides”. It is also unclear how the both limitations are to be interpreted for the hole demarcation as distinct limitations since the first limitation already definitely defines the hole as being within the pad.

6. Claim 26 recites the limitation "second metal layer" in line 2-3 lacks antecedent. There is insufficient antecedent basis for this limitation in the claim. There is no “second metal layer” in either claim 25 or claim 1.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 2, 3, 5, 9, 10, 13, 18, 19, 21, 25, 27, 31 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Dishon USPN 4,950,623.

9. Regarding claim 1, Dishon teaches forming a resist layer, as a photoresist inherently necessary to define through hole through layer 12 and overlap in line 42, column 3 would inherently require the photoresist overlap of the pad. Dishon teaches forming an opening in an insulating film in passivation layer 12, (line 42, column 3), the opening exposing at least a part of the pad, as shown in Fig. 1. Dishon teaches forming a metal layer, as metal layer 13 and 14 (line 45, column 3, lines 60-63, column 3 and line

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25 column 4), constitutes a bump as described by line 31 column 4, is formed after the opening, as shown by Fig. 1 to Fig. 3, the metal layer, 13 and 14, is connected to the portion of the pad exposed at the opening as shown in Figs. 2 and 3.

Regarding claim 2, Dishon teaches that the hole in the passivation layer does not protrude from the pad periphery since in lines 41-43, column 3, the passivation shall have overlap of the pad, photoresist so coordinated.

Regarding claim 3, Dishon teaches the insulating film being thicker at the end of the pad than at the center...since there is no passivation layer 12 at the center of pad 11 as shown in Fig. 1 makes the thickness towards the end of the pad definitely thicker than the thickness at the center, where it is completely absent.

Regarding claim 5, Dishon teaches metal layers 13 and 14 see claim 1 rejection above, the second metal 14 is formed on metal layer 13 as shown in Fig. 2.

Regarding claims 9 and 10, Dishon teaches both metal layers, 13 and 14, have their tips extending beyond the through hole: layer 13a explicitly extends (overlaps) the passivation layer 12, as described in line 7, column 4, as seen in Fig. 3; layer 14 extending beyond layer 13a also as seen in Fig. 3.

Regarding claim 13, Dishon provides solder on the metal layer as solder 15 line 26 column 4.

Regarding claim 18, Dishon's first metal can be of nickel (line 51, column 3).

Regarding claim 19, Dishon's second metal can include gold (lines 65-66, column 3).

Regarding claim 21, Dishon teaches Sn as tin in the 'lead/tin' (line 63 column 3).

Regarding claims 25, 27, 31 and 32. Dishon teaches the method for device wafers (i.e. semiconductor chips of a wafer) and chip carriers (line 39 column 2) and different substrates (lines 41-42 column 2).

Devices also as described in lines 18-20 column 1.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dishon as applied to claim 5 above, and further in view of Tsai USPN 6,300,250.

12. Regarding claims 11 and 12, Dishon is silent on the mode of depositing metal layer 13 and 14 as first and second metal layers. Tsai teaches depositing first and second layers by rf sputtering (line 21, column 7 and line 36, column 7) is electroless. It would have been obvious to one having ordinary skill in the art at the time the invention was made to deposit the first and second metal layers in the manner such as rf sputtering as taught by Tsai for the purpose of providing the first and second metal layers.

Allowable Subject Matter

13. Claims 6, 8, 14, 15, 16, 17, 20, 22, 23, 24 are objected to as depending from a rejected base claim. Claim 6: The opening in the insulative layer being larger than the “resist layer defined through hole” was found in Chickawa et. al. as explained in previous action. Both Dishon and Chickawa et. al. inherently have a resist that defines a through hole but such a resist is further associated (is used) with etching the insulative layer and not for defining “a region for forming the first metal layer and an exposed portion of the pad”.

Claim 8 and claims 16 and 17:

The first metal layer formed in the through hole (the through hole that was defined by the ‘pad overlapping resist’ in claim 1) is forming the first metal layer into the resist opening was not found.

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Closest art in Chickawa et. al. does so for a metal bump, but the bump is interpreted as a third metal counting Chickawa's et. al. UBM metallurgy as first and second metal layers.

Claim 14: Dishon fails to teach resin.

Claim 15: The metal layer flush with the resist is inherent in Dishon as expressed in the conventional photoresist technique of line 12 column 14 but the limitation that the solder provided at a portion of the metal layer exposed from the resist is absent in Dishon since Dishon is silent regarding the presence of the resist apparently relying on the non-wettability of the passivation layer.

Claim 20: Dishon's second metal does not include solder, rather is a solder soluble metal.

Claim 22: Dishon fails to provide the second metal layer as two Au layers formed by immersion and autocatalytic methods.

Claims 23 and 24: Dishon fails to provide the second metal layer using immersion and autocatalytic plating methods, thus claim 24 is also permitted.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lishon, et. al., USPN5,137,845 teach of forming a bump.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael K. Luhrs whose telephone number is 703-305-2864. The examiner can normally be reached on M-F; 8:00 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on 703-308-2816. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

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Michael K. Luhrs
September 16, 2003



MICHAEL S. LEBENTRITT
PRIMARY EXAMINER